

THE OHIO DIVISION GEOLOGICAL SURVEY

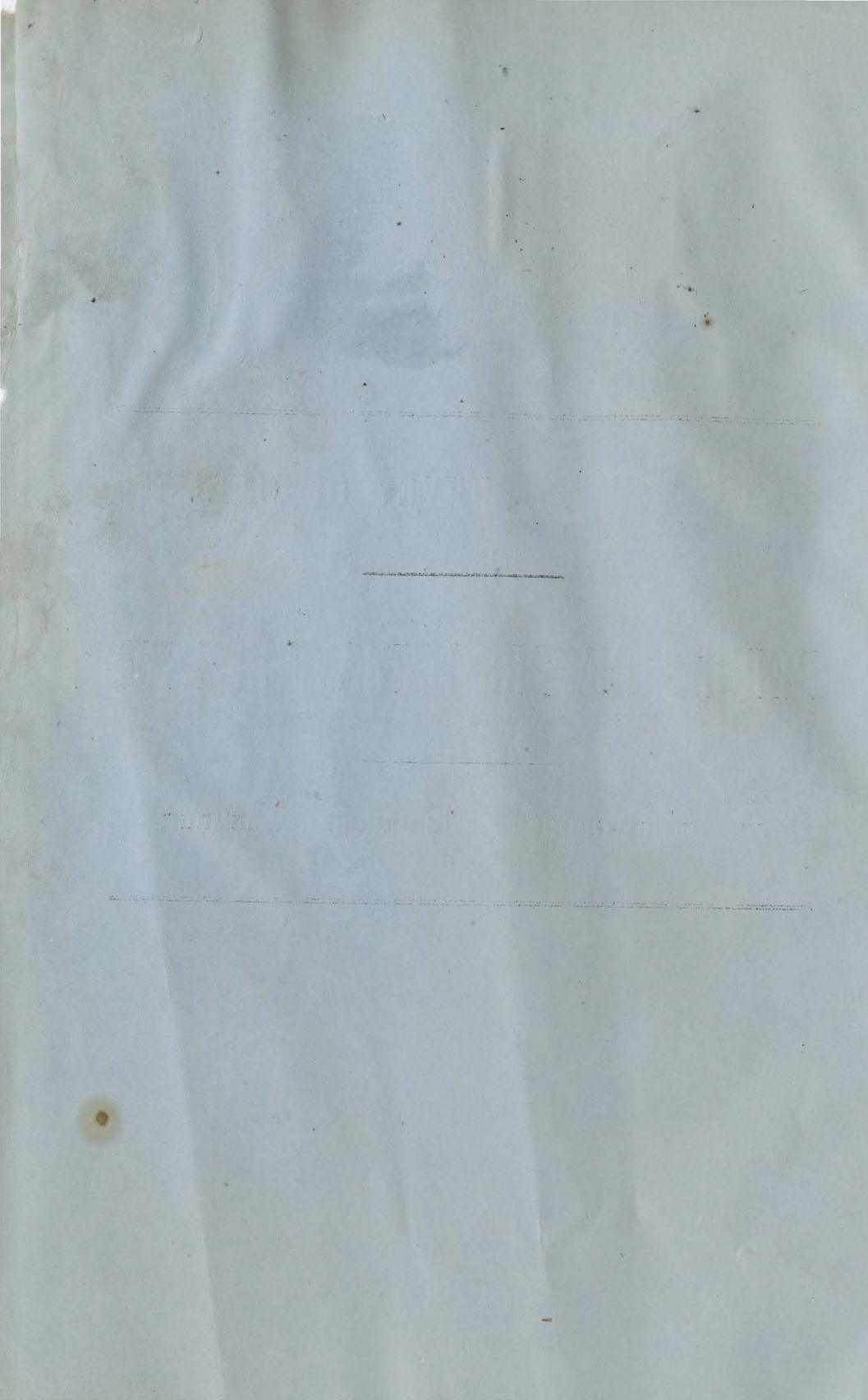
Book #651



GEOLOGICAL SURVEY OF OHIO.

REPORT OF PROGRESS FOR 1871.

PRINTED BY ORDER OF THE GENERAL ASSEMBLY.



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EXECUTIVE DEPARTMENT,
COLUMBUS, OHIO, February 28, 1872.

To the General Assembly :

I have the honor to transmit herewith Report of Progress for the year 1871, in the matter of the Geological Survey of the State of Ohio.

In presenting this report, I desire especially to urge upon the Legislature, the propriety of such legislation as will ensure the further prosecution of this work, now well advanced toward completion. The survey has already been of incalculable advantage to the people, and promises much for the future. There can be no wiser economy than in judiciously appropriating whatever sums of money may be necessary for the development of the material resources of the State, as it will add largely to the present value of what we have, and will invite capital from distant parts of the country.

Your favorable consideration of this subject is respectfully solicited.

But one copy of the Report having been furnished this Department, it is sent to the House of Representatives.

Very respectfully,

EDWARD F. NOYES, *Governor.*

REPORT OF PROGRESS OF THE GEOLOGICAL SURVEY OF OHIO, FOR THE YEAR 1871.

To His Excellency EDWARD F. NOYES, Governor of Ohio :

DEAR SIR: I have the honor to submit herewith the following brief Report on the progress of the Geological Survey of Ohio, for the year 1871.

As you are probably aware, the law authorizing the Geological Survey required that it should commence June 1st, 1869 and provides for its continuance during three years from that date. It also provides that in January of each year, during the continuance of the Survey, the Chief Geologist shall make to the Governor a report of progress; and that "when the Survey shall have been fully completed" the Chief Geologist shall embody the results in a final Report and Geological Map.

In compliance with these requirements, I have presented two reports of progress, with accompanying reports from the different members of the Corps, and these reports have been published by the Legislature. It was as I know, the intention of the framers of the organic law of the Survey that these annual reports of progress should be brief business statements of the progress and wants of the Survey; such as could be printed without delay, and thus enable the Legislatures to which they might be presented to legislate intelligently upon this branch of the public service.

If the reports already published have not been of such character, but have been voluminous documents of which the publication has been delayed for months by copious and expensive illustrations, it is but justice to myself to say that the responsibility rests with others, and not with me. My portions of these reports have been promptly prepared, brief, and without illustration, except a single wood-cut engraved before the presentation of the report.

Holding the same view as formerly, as to the proper scope and volume of my annual report, I shall now offer a summary of our work of the past year and of our plans for the future, so brief that it will not be a fair exposition of the duty done, yet such as I hope will contribute something toward a better understanding on the part of those by whom the Survey was created and is sustained, of what it has accomplished.

In my former reports, I have sketched the organization of the Geological Survey and its history to the close of the year 1870. To avoid repetition, therefore, I will refer those not fully informed on this subject to the historical portions of those reports, and confine myself now to such statements as are necessary to convey an idea of the progress of our work during the last year.

In the law providing for the Geological Survey, the Geological Corps is required: first, to determine the general geological structure of the State. This, a necessary preliminary to our subsequent detail work, was mainly accomplished during the year 1869, and a summary of the results are given in the Geological Map and descriptive text of our first Report of Progress. We are also required to make a detailed Survey of each and every one of the eighty-eight counties of which the State is composed. This is plainly the most important and laborious duty to be performed by the corps, and it has naturally occupied most of our time to the present date. All the counties in the State have been visited. Of fifty-eight counties the surveys have been completed, and so much has been done on the others that we may fairly consider three-fourths of this part of our work as finished.

In continuing the surveys of counties through the past year, the plan has been followed which was adopted at the beginning. I then assigned the counties lying south and east of Columbus, seventeen in number, to Prof. E. B. Andrews; those lying south and west of Columbus, a nearly equivalent area, to Prof. Edward Orton, while those counties lying north of Columbus—forming three-fifths of the State—were left under my own more immediate supervision.

In making this allotment of territory, I did not relinquish the responsibility which I had assumed as Superintendent of the work in the entire State; but some division of labor was necessary, and this seemed the most natural one, as Professors Andrews and Orton had resided for years in the districts assigned to them, and had already acquired much knowledge that could be made available in the prosecution of their work. I have given the Assistant Geologists as much honor and independence as I could do consistent with my obligation to those from whom I have received the trust I hold; but I have made such visits to the different sections of the State as the interests of the survey seemed to require, and it is my intention before the publication of a final report, and before accepting the responsibility of the reports of other members of the corps, to review their work, so far, at least, that I may intelligently endorse or dissent from their conclusions.

During the past season of field work, my own time has been mainly spent in the progressive southerly exploration of the coal field, alluded

to in my last report. In the prosecution of this work I have now made surveys of all the coal-producing counties lying north of those traversed by the National Road, and I propose in the coming season to connect my work with that of Prof. Andrews, and go through to the Ohio River.

In that part of the State where I have taken the immediate supervision of the survey, I have kept, during a part of the past season, a larger force employed than heretofore, as there was here much the most work to do. This force consisted of Prof. J. T. Hodge, Prof. J. J. Stevenson, Mr. M. C. Read, Mr. N. H. Winchell, Prof. W. B. Potter, and Messrs. Henry Newton, Ogden Haight, H. M. Smith, A. W. Wheat, J. A. Goldsmith and I. L. Lilienthal. Of these, Messrs. Read, Hodges, Stevenson and Winchell, were paid at the rate of \$100 per month, besides traveling expenses. Messrs. Potter, Goldsmith, Haight, Lilienthal and Smith—all graduates of the school of mines—received no other compensation than their traveling expenses, while Mr. Wheat and Mr. Newton received \$50 and expenses, each, per month. The terms of service of these gentlemen are as follows: Messrs. Read and Winchell six months; Messrs. Hodge, Stevenson and Newton, three months; Mr. Wheat two months, and the others one month each.

During the season, surveys were made or completed in the counties of Stark, Tuscarawas, Jefferson, Columbiana, Mahoning, Trumbull, Licking, Richland, Knox, Coshocton, Harrison, Medina, Lorain, Ottawa, Sandusky, Wyandot, Marion, Hardin, Hancock, Wood, Putnam, Allen, Auglaize, and Mercer. Partial Surveys were also made of Portage, Carroll and Wayne.

In the south-eastern section of the State Prof. Andrews has, during the past season, been engaged in the study of the counties lying eastward of those which occupied his attention in the preceding seasons, and of which descriptions are included in his contribution to the Reports of Progress, for 1869 and 1870. During the last season, as before, he has been assisted by Mr. W. B. Gilbert—paid \$100 per month and expenses—and has so far progressed in the explorations of his field of labor as to be able, as he informs me, to complete the work in another season in the manner in which it has been hitherto done. I should also say, that Mr. W. J. Herdman, at my request, spent the month of September in tracing some of our coal-seams into Prof. Andrews' district, at a cost to the State of \$75, for traveling expenses. Also that a considerable portion of the expense account paid to Messrs. Newton and Smith was incurred in carrying through the Southern iron region a careful review of the iron industry, which has now been extended over the entire State.

Prof. Orton has, during the past year, continued the work in his district in the same thorough manner as heretofore. He was assisted by Prof. John Hussey, Messrs. H. Herzer and Robert Warder, employed for different terms and paid a gross sum of \$675.

All the counties originally assigned to Prof. Orton have been surveyed, except Madison, and the portions of Franklin, Pickaway, Ross, Pike and Scioto, lying west of the Scioto river. In the latter three also, considerable work has already been done, so that in another season, if allowed the same amount of assistance as during the past, he will not only complete the Survey in his district, but be able to make and complete the surveys of Shelby, Champaign, Logan and Union.

AGRICULTURAL SURVEY

In our last report, Mr. Klippart sketches the plan he has adopted for the Agricultural Survey required by the law, and reports the progress made up to the date of publication of that volume. During the past season, he has continued his investigations with commendable diligence; has now gone over about three-fourths of the State, and has gathered a very large amount of interesting and important facts. As I have before stated, I hope to be able to procure, without expense to the State, for publication in the Agricultural volume of our Final Report, descriptive catalogues of the plants and animals of the State. These have an intimate relation with agriculture, and a better knowledge of them is earnestly craved by a large number of our citizens.

CHEMICAL DEPARTMENT.

The Chemist of the Survey, Prof. T. G. Wormley, has been constantly engaged during the year past, in the examination of our coals, ores and other useful minerals. He has kept two assistants at work in his laboratory. One, Mr. Weber, paid \$75 per month from the Geological fund—the other paid by Prof. Wormley. Already some 550 analyses have been made for the Survey, and the report of Dr. Wormley, contained in the last volume, gives abundant evidence of the care and accuracy with which they have been performed.

PALÆONTOLOGY

Much new material, illustrative of the Palæontology of the State, has been gathered during the past year, among which, I may mention, a fine suite of the bones of the great ganoid fish, *Dinichthys*, obtained by Mr. Wheat, in Sheffield, Lorain county; fishes and reptiles from the coal rocks at Clinton, Jefferson county, &c. I should also mention that the Cincin-

nati Geologists, Messrs. Dyer, James, Miller, Shaeffer, and others, have kindly given us the use of their splendid collections of fossils, the fruits of many years labor among the rich deposits of the hills bordering the Ohio. These, with much other material, have been carefully studied by Mr. Meek. He has described the new species, and had them drawn in a manner that can hardly be surpassed in this country, or abroad. Mr. Meek has given us about half his time for the past year, at \$150 per month, and has furnished me twenty-five beautiful plates for our

FINAL REPORT.

The first and second of the four volumes composing our final report, are devoted to geology and palæontology; that is, the geology of counties, with figures and descriptions of the new species of fossil plants and animals, found in the different formations. Each of these volumes is to be illustrated by fifty plates.

The third volume of the series, is devoted to Economic Geology, and will contain the results of our examinations of our coals, iron ores, clays, limestones, marls, &c., &c. In this volume, will be found a complete review of our iron industry, already finished, embracing statistics of construction and production of every furnace in the State, and comparisons of these with the materials, methods and results of the iron manufacture in Europe. I may say, in passing, that this review demonstrates that our iron industry is altogether behind the age; that now, a removal of the duty on foreign iron would blow out every one of our furnaces; but that with the abundance and excellence of our materials, if our iron men will introduce improvements, now generally adopted in the best iron smelting establishments of the old world, they can protect themselves against all changes of legislation, and defy foreign competition.

The fourth volume of our final report, will be devoted to Agriculture, Zoology and Botany

Of the volumes I have enumerated, the first is ready for publication, the other three are more than half done.

STATE CABINET.

We are required by law to collect specimens of our rocks, fossils, ores, &c., to form a State Cabinet. In compliance with this requirement, over one hundred and fifty boxes of specimens have been collected and sent to Columbus. These specimens have been stored and partially displayed in room 100, in the State House. No suitable provision can, however, be made in the Capitol for the Cabinet, and it is hoped that it will be provided for in the new building of the Ohio Agricultural College. Much of

the material collected is of great interest and value, and is no less worthy of preservation and exhibition, than that for which the State of New York has appropriated an entire and expensive building, and Illinois is making ample provision in her new State House.

As the best specimens in room 100, were being injured by dust or rapidly evaporating, I have had them placed under glass in cheap cases, where they can be seen and yet be safe. These cases are made portable, so that they may be transferred to another room, when that shall be provided.

COMPLETION OF THE SURVEY

When the law providing for the Geological Survey was passed, and the term of three years fixed for its continuance, it was not supposed that it would be possible to complete the work within the specified period. From the very beginning, however, I have had the hope and purpose to finish the survey at or soon after the expiration of the allotted time. To accomplish this, I have asked for, and received a somewhat larger annual appropriation than that granted during the first year, and have put as large a force into the field as could be judiciously employed. By all the means at my command, the work has been pushed forward with the greatest possible rapidity, consistent with thoroughness, and I am happy to be able to state, that so good progress has been made, that if the appropriations asked from the present Legislature be granted, not only the field work of the Survey will be completed, but the Final Report required by the organic law, (though as something additional to, and to be prepared after the completion of the Survey,) will be ready for publication within the present year.

COST OF THE SURVEY.

The entire sum paid from the State treasury for the field and office work of the survey to January 1, 1872, is \$51,000, with an unexpended balance of appropriation of \$1,050. I have asked for an additional appropriation of \$13,900 for the current year. As provision has already been made by the Legislature to carry on the survey to May 15, 1872, the additional amount which is asked, is \$10,000. With this appropriation, it will be possible to complete the examination of every county of the State on the same scale on which the work has thus far been carried on. Should this be granted, the entire cost of the field and office work of the survey—all for which the corps is responsible,—will be \$65,900.

The cost of the publication of the results of the survey will rest with the Legislature, and will depend on the style and size of the editions of

the volumes printed. Whatever it may be, to some persons it will seem large, but the expenditure will have been distributed through a number of years, and I have no hesitation in saying will be repaid a hundred fold to the people of the State in the revelation it will make of the quality, quantity and uses of our mineral staples.

Illinois and California are spending much more than we shall do, on both the field work, and publications of their Geological Surveys, and the survey of New York has cost that State more than \$650,000.

In conclusion, I may say that this report would have been prepared at an earlier date if I had not been for a time disabled by chills and fever contracted in the service of the State.

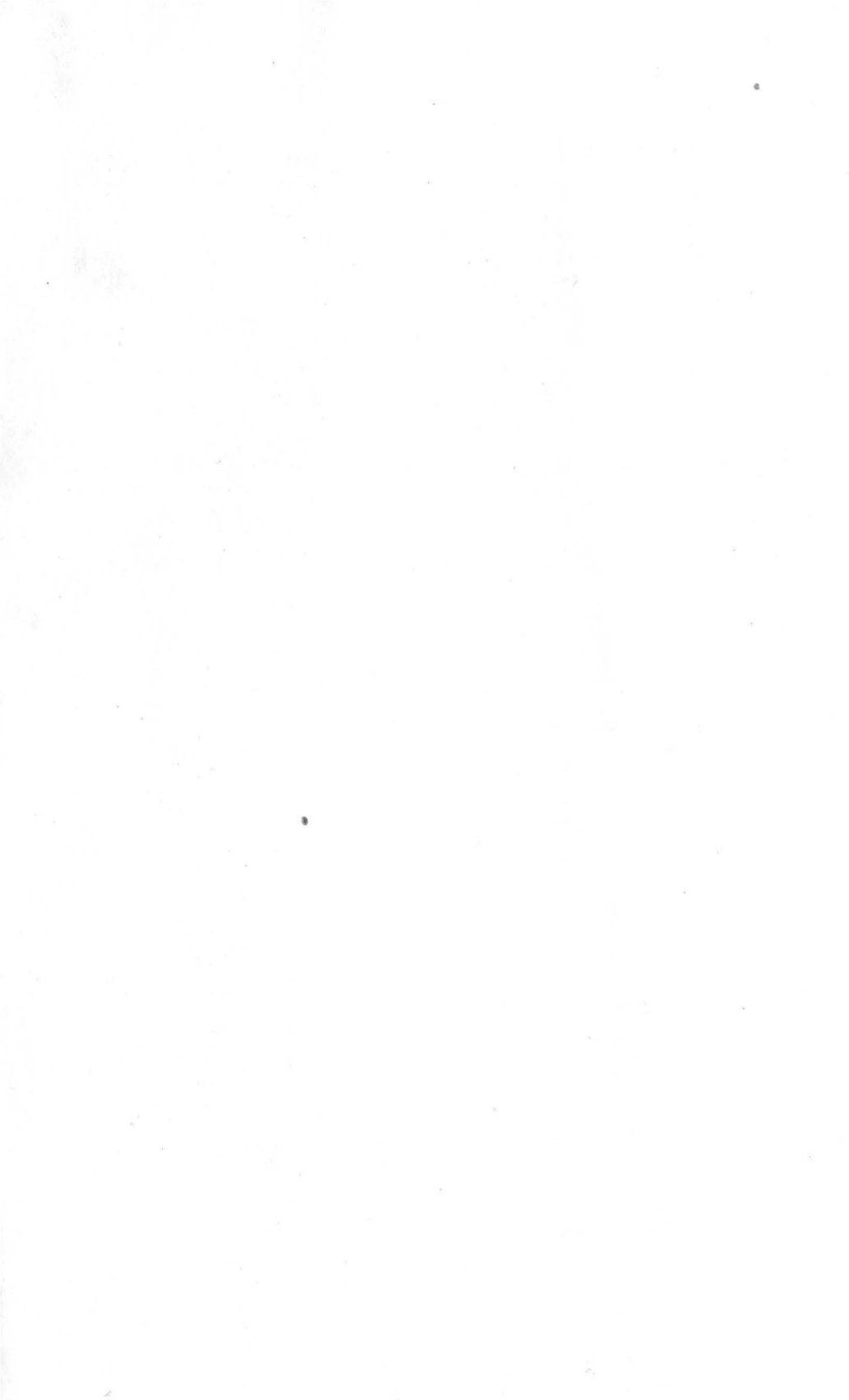
Very respectfully,

Your obedient servant,

J. S. NEWBERRY,

Chief Geologist.

COLUMBUS, OHIO, February 15, 1872.



PAPER FROM PROF E B. ANDREWS.

COLUMBUS, O., February 1, 1872.

HON. EDWARD F. NOYES, *Governor of the State of Ohio* :

DEAR SIR :—In accordance with your request for information relative to the work already done and yet to be done, upon the Geological Survey of the State, I have the honor to give the following statement of facts concerning the Second Geological District, to which my own personal labors have been confined.

The Second District includes the south-eastern portion of the State, bounded by the Central Ohio Railroad on the north, by the Ohio river on the east and south, and, approximately, by the Scioto river on the west. The larger part of the district is within the limits of the productive coal measures. The work of the survey began in June, 1869. In 1869, proximate outlines of the various formations were run, and a good beginning made upon the detailed study of the stratigraphical and economic geology of the coal measures. The survey of that season covered parts of Licking and Muskingum counties, all of Perry, and portions of Hocking and Athens, the plan of investigation being to follow the strata of the lower coal measures from the north to the south line of the district. These investigations, in 1869, proved to be of great value to the State, by authenticating the quantity and quality of coals, thereby contributing to an enormous advance in the market values of large areas of coal lands, and giving stimulus to mining industries, and to the building of several railroads.

In 1870, investigation extended from the vicinity of Nelsonville, along the lower coal measures, through Hocking, the western part of Athens, through all of Vinton, all of Jackson, all of Lawrence, all of the mineral portion of Scioto, and a part of Gallia. The results of this work are embodied in the Report for 1870. They are of the highest economic value and importance, and reveal many facts of great scientific interest. The counties above named contain the finest iron-ores of the State, and sustain a large number of furnaces.

In 1871, my investigations extended through nearly all the remaining counties of the district lying within the limits of the coal field. They are

Meigs, Athens, Morgan, Muskingum, Noble, Guernsey, Belmont and Monroe. It has been my aim to carry on my work with such minute accuracy of detail, and so to exhibit it in my reports, by maps and sections, that the reports shall serve as a guide and hand-book for the people of the several counties. Generally, each town in every county has been visited. I have also, so far as possible, gathered representative samples of coals, iron-ores, fire-clays, limestones, hydraulic limestones, etc., etc., for chemical analysis by Prof. Wormley, and many of the results already reached by him are of the highest value.

There remains to be done :—

First. More *stratigraphical work* in a limited portion of the district, In Washington county there are some well-marked uplifts, along the axis of which much petroleum has been obtained. A careful and accurate determination of the position and dip of the strata along these lines of disturbance is very desirable, and will require considerable field-work. The counties situated upon the Waverly formation will require additional investigation in regard to the building stone they may contain.

Second. There must be *special investigations* made of the coals, ores, limestones, including hydraulic limestones, fire-clays, brines, petroleum, building stones, sand-rock for glass, etc., etc., before the work of the district may be said to be complete in its economic aspects. For this work a chemical department of the survey will be imperatively needed.

Third. There should be carried on, at the same time, the work of collecting and investigating the various extinct forms of animal and vegetable life, which lie buried in the rocks of the district. To many, this work possesses peculiar interest, and the survey would be very incomplete without it. For this part of the work in the Second District, there has been, as yet, very little time devoted, except in making a few collections of fossils, most of which are in the very competent hands of Mr. F. B. Meek, of Washington, for examination and description.

In conclusion, I may state that to complete the work of the survey in the Second District, with that fullness and entire accuracy of details which should characterize all scientific work, and which alone will command the confidence of scientific men, on the one hand, and of the intelligent capitalist on the other, will require two or three years more of time, and this time to be devoted exclusively to the work. For such devotion and labor the geologist should be paid an adequate compensation.

I am, with great respect,

Very truly, yours,

E. B. ANDREWS,

Assistant Geologist.



